

Notice of Allowability

Application No.

10/730,383

Examiner

B. James Peikari

Applicant(s)

LIU ET AL.

Art Unit

2186

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the amendment of January 14, 2005 and the telephone interview of March 14, 2005.
2. ☒ The allowed claim(s) is/are 1-10, 12-17 and 19-30.
3. ☒ The drawings filed on 08 December 2003 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date 3/3/04 & 10/1/04
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in telephone interviews with John S. Jardine (#48,835) on March 14 and 18 and 19, 2005.

The application has been amended as follows:

- Please enter the attached amendments.

REASONS FOR ALLOWANCE

2. The following is an examiner's statement of reasons for allowance:

(a) With regard to applicant's traversal of the restriction requirement in the remarks attached to the amendment filed on January 14, 2005, these arguments were not deemed convincing, however, the examiner subsequently realized that certain of the dependent claims may act as linking claims. Consequently, the previous restriction requirement is withdrawn.

(b) Upon careful review of the claims and the specification, the examiner has determined that none of the *individual* techniques described for determining a caching strategy for bypassing and/or flushing are new or novel. These include utilizing a hit/miss ratio, clean/dirty ratio, remaining clean lines, rate of cache fill, access

frequency, data transfer sizes, maps, time-in-cache (i.e., age), line sizes or cache sizes – each of which was well known at the time of the invention.

Most prior art systems utilized one or two of these criteria to determine how and when cached data should be replaced. Notes the references cited herewith that use some of these criteria to determine whether a cache should be bypassed: U.S. Patent Numbers 5,958,068, 6,748,492, 5,625,793 and 5,729,713. The novelty of the present invention relies on the non-obvious combination of *many or all* of these individual techniques, balanced against each other, to produce an algorithm that optimizes cache bypassing and cache updating.

(c) On March 13, 2005, the examiner contacted applicant's representative, John S. Jardine, to share these findings. On March 14 and 18 and 19, 2005, discussions were held wherein the examiner explained that although the independent claims and most of the dependent claims were not novel (no particular prior art references were discussed), claims 9, 11, 13 and 18 were novel and suggested that the features of these claims be incorporated into the independent claims of the invention.

Applicant mentioned several new references, which the examiner considered. These are listed on pages 2 and 3 of the attached form PTO 892. Since applicant originally noted these, copies are not being furnished herewith.

(d) On March 19, 2005, applicant faxed the examiner a draft amendment, for which the examiner has requested entry herewith. None of the references cited by applicant or by the examiner are deemed to teach or suggest, either alone or in any

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reasonable combination, each and all of the features of these amended independent claims.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to James Peikari whose telephone number is (571) 272-4185. The examiner is generally available between 7:00 am and 7:30 pm, EST, Monday through Wednesday, and between 5:30 am and 4:00 pm on Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Kim, can be reached at (571) 272-4182.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Tech Center 2100 central hotline at (571) 272-2100.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 746-7239 (Official communications)

or:

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(703) 746-7240 (for Informal or Draft communications)

or:

(703) 746-7238 (for After-Final communications)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive,
Arlington, VA., Sixth Floor (Receptionist).



B. James Peikari
Primary Examiner
Art Unit 2186

3/20/05

PATENTIN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Liu, et al.	Examiner:	Peikari, Behzad
Serial No.:	10/730,383	Group Art Unit:	2186
Filed:	December 8, 2003	Docket:	1004.3USU1
Title:	DATA-AWARE DATA FLOW MANAGER		

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office on March 19, 2005

By: 

Name: John S. Jardine

AMENDMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Prior to mailing an Office action for the above-identified patent application, please enter the following amendment.

AMENDMENTS TO CLAIMS

Please amend the claims as follows (*wherein additions are shown by underlining and deletions are shown by strikethrough in amended claims*):

1. (Currently amended): An apparatus, comprising:
 - a target module arranged to communicate with a client requesting access to a storage;
 - a host module arranged to communicate with the storage;
 - a cache arranged to selectively store data flowing through the apparatus; and
 - a control module arranged to determine whether to store data flowing between the client and the storage in the cache and to pipe the data directly between the host module and the target module if the data is not to be cached, wherein the control module is further arranged to access policies including preferred data transfer sizes, mappings of caches to storage or storages, time data can remain in a cache before being flushed, cache line sizes, and cache sizes.
2. (Original): The apparatus of claim 1, wherein at least one of the modules comprises a software component.
3. (Original): The apparatus of claim 1, wherein at least one of the modules comprises a hardware module.
4. (Original): The apparatus of claim 1, wherein the client is a process or component residing on the apparatus.

5. (Original): The apparatus of claim 1, wherein the client is a process or component residing on another apparatus.

6. (Original): The apparatus of claim 1, wherein the storage spans a portion or all of one or more physical storage media.

7. (Original): The apparatus of claim 6, wherein the physical storage media resides on the apparatus.

8. (Original): The apparatus of claim 6, wherein the physical storage media resides on one or more devices other than the apparatus.

9. (Original): The apparatus of claim 1, wherein the control module uses cache statistics to determine whether to store the data in the cache, the cache statistics including hit/miss ratio, clean/dirty ratio, remaining clean lines, rate of cache fill, and data access frequency.

10. (Original): The apparatus of claim 1, wherein the cache mirrors at least a portion of a cache on a redundant apparatus.

11. (Cancelled).

12. (Original): The apparatus of claim 1, wherein the control module is further arranged to determine a pattern of the data and wherein determining whether to store the data is based on the pattern, a state of the cache, and a policy.

13. (Original): The apparatus of claim 1, wherein the control module comprises:
a flush manager arranged to manage the pace and details of flushing the cache;
a system statistics manager arranged to collect information associated with the data flowing between the client and the storage, the information including cache hits, misses, and utilization, how much of the data is stored in the cache, how much of the data is piped directly between the host module and the target module, sizes of reads and writes associated with the data, and how sequential the data is.

14. (Original): The apparatus of claim 13, wherein the control module further comprises:
a fail-over manager arranged to communicate with a redundant apparatus to find a path between the client and the storage when the apparatus loses one or more paths to the storage or client or to have the redundant apparatus take over duties of the apparatus should the fail-over manager partially or completely fail; and
an auto-configuration manager arranged to configure the cache, determine whether a redundant apparatus exists, and configure connections to the client and storage including configuring the target and host modules.

15. (Currently amended): A computer-readable medium having computer-executable instructions, comprising:
receiving a request to access a storage, the request associated with data to be stored on or retrieved from the storage;
determining whether to cache the data in a cache, wherein determining whether to cache the data in a cache comprises determining whether the request is a request to store data on

the storage and, if so, caching the data together with other data associated with other requests until a selectable size of accumulated data has been cached and then writing the accumulated data to the storage;

if the data is to be cached, caching the data in the cache; and

if the data is not to be cached, bypassing the cache.

16. (Original): The computer-readable medium of claim 15, wherein determining whether to cache the data in a cache comprises determining whether a failure is pending and if so, bypassing the cache.

17. (Original): The computer-readable medium of claim 15, wherein the storage is associated with a policy that indicates that data associated with the storage should not be cached and wherein determining whether to cache the data in the cache applies the policy.

18. (Cancelled).

19. (Original): The computer-readable medium of claim 15; wherein determining whether to cache the data comprises applying a policy that has different effects depending on whether the request is to store data on or retrieve data from the storage.

20. (Original): The computer-readable medium of claim 15, wherein a policy indicates that there should be no write-back caching and wherein determining whether to cache the data in a cache applies the policy, such that the cache is bypassed on requests to write to the storage.

21. (Original): The computer-readable medium of claim 15, wherein determining whether to cache the data comprises applying a policy that indicates that the cache should be bypassed for reads or writes exceeding a certain size.

22. (Original): The computer-readable medium of claim 15, wherein determining whether to cache the data is based on a stress associated with the cache.

23. (Original): The computer-readable medium of claim 22, wherein the cache includes a number of dirty lines and the stress is calculated based on whether the number of dirty lines in the cache exceeds a threshold, whether a flush is required to cache the data, and whether flushes from the cache are keeping up with writes to the cache.

24. (Original): The computer-readable medium of claim 15, wherein determining whether to cache the data is based on whether the cache is recovering after a failure.

25. (Original): The computer-readable medium of claim 15, further comprising storage the cache on a local non-volatile memory in anticipation of a system failure.

26. (Original): The computer-readable medium of claim 15, further comprising collecting information including hit/miss performance, dirty lines in the cache, stress conditions of the cache, space available in the cache to store any data, utilization of the cache, sizes of reads and writes, how sequential or non-sequential requested data is, information associated with an operating system on a system upon which the cache resides, information associated with hardware of the system upon which the cache resides.

27. (Original): The computer-readable medium of claim 26, wherein the cache has an allocated number of clean and dirty lines and further comprising dynamically adjusting the number of clean and dirty lines based on a ratio of reads verses writes to the storage.

28. (Original): The computer-readable medium of claim 15, further comprising flushing the cache when a bandwidth utilized to the storage is below a threshold.

29. (Currently amended): A computer-readable medium having computer-executable components, comprising:

a target component arranged to receive a request to access a storage;

a host component arranged to communicate with the storage;

a control component arranged to determine whether to store data associated with the request in a cache and to pipe the data directly between the host component and the target component if the data is not to be cached;

a flush component arranged to manage pace and details of flushing the cache;

a system statistics component arranged to collect information associated with the data, the information including cache hits, misses, and utilization. how much of the data is stored in the cache. how much of the data is piped directly between the host component and the target component, sizes of reads and writes associated with the data, and how sequential the data is.

30. (Currently amended): An apparatus, comprising:

a target module arranged to communicate with a client requesting access to a storage;

a host module arranged to communicate with the storage;

a cache arranged to selectively store data flowing through the apparatus; and

means for determining whether to store data flowing between the client and the storage in the cache and to pipe the data directly between the host module and the target module if the data is not to be cached, wherein the means is arranged to evaluate cache statistics to determine whether to store the data in the cache or to pipe the data directly between the host module and the target module, the cache statistics including hit/miss ratio, clean/dirty ratio, remaining clean lines, rate of cache fill, and data access frequency.

REMARKS

By present amendment, claims 1, 15, 29, and 30 have been amended. Claims 11 and 18 have been cancelled. No claims have been added. Claims 1-10, 12-17, and 19-30 remain pending.

Applicants thank the Examiner for calling applicants' attorney on March 14, 2005, to discuss applicants' application. During that discussion, the Examiner indicated that he was withdrawing the restriction requirement and also indicated allowable subject matter in claims including 9, 11, 13, and 18.

In this amendment, claim 1 has been amended to substantially include the subject matter of claim 11 (which has been cancelled as duplicative) while claim 15 has been amended to substantially include the subject matter of claim 18 (which has been cancelled as duplicative). Claim 29 has been amended to include subject matter similar to the subject matter of claim 13, while claim 30 has been amended to include subject matter similar to the subject matter of claim 9.

Applicants respectfully submit that the claims as presented were patentable over the prior art of record and that the amendments herein are to expedite allowance and not in view of the prior art.

CONCLUSION

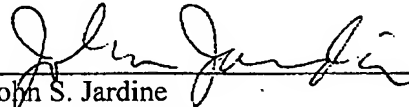
In view of the foregoing remarks, it is respectfully submitted that claims 1-10, 12-17, and 19-30 are patentable over the prior art of record, and that the application is good and proper form for allowance. A favorable action on the part of the Examiner is earnestly solicited.

If in the opinion of the Examiner a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney at (425) 467-5686.

Respectfully submitted,

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